REMARKS

Applicant has amended claims 47 and 61, and added new claims 64-69. Independent claim 51 has not been amended in this Amendment. Claims 47-69 are currently pending in this application.

In the Office Action, the Examiner rejected claims 47-63 under 35 U.S.C. Section 103(a) as being obvious over Zhang (US Patent No. 5,881,130) in view of Liu (US Patent No. 6,266,395). Applicant traverses the rejection.

As discussed at length in a previous response, an important feature taught by the present invention is qualifying a physical wire line for xDSL use from only a **single end** without having to rely on another testing equipment at another end and without relying on a plant map database. According to the present invention, this is accomplished by using a TDR to transmit a signal and receive a return waveform. Based on the received return waveform, a transfer function of the wire line is obtained. A transfer function is essentially a signal attenuation level at various frequencies that are used in the xDSL band.

The specification of the present invention teaches at least two different embodiments to derive the transfer function. In one embodiment, a physical layout (plant map) of the wire line is derived from the return waveform without using the plant map database. The plant map includes such data as the wire gauge and

distance for each segment of the wire line. For example, the wire line can be composed of 1500 feet of 20 gauge wire from a central office, followed by a 350 feet of 26 gauge wire going into a subscriber's house. This plant map is then fed into a circuit modeling analysis to derive the transfer function. In another embodiment, the return waveform is compared to a library of known transfer functions that represent known wire plant models to find the best matched transfer function.

From the derived transfer function, determination is made as to whether a line qualifies for an xDSL service. This is done, for example, by calculating a signal to noise ratio over the frequency bands of the xDSL.

In sum, the present invention requires two elements: 1) **use of a TDR** at a single end of a line; 2) **deriving a transfer function** (signal loss) over the plurality of xDSL frequencies **from the return waveform.**

As can be appreciated by persons skilled in the art, the single ended testing feature of the present invention using a TDR at only a single end of the wire line provides many advantages including substantial cost savings and efficient testing. Applicant submits that no prior art teaches the derivation of a transfer function from a return waveform that is obtained by a TDR at a single end.

This inventive feature is recited in claim 47 as "obtaining a return waveform by **using a TDR at a single end** of a wire

communication line" and "determining a transfer function **based on the return waveform**"

In the Office Action on page 3, last paragraph, the Examiner implies that Liu teaches obtaining a transfer function that is based on a received return waveform transmitted by a TDR at a single end of the line. Applicant disagrees.

As the Examiner correctly noted, Liu obtains a transfer function (signal loss over the plurality of xDSL bands) from the information stored in a plant map database. Liu states at col. 3, lines 17-23 that "These physical characteristics of the subscriber loop are preferably obtained from database queries." Presumably, the retrieved plant map then will be the basis for obtaining a transfer function. At col. 7, lines 6-21, Liu does mention that some predetermined electrical characteristics are measured from the line itself. These characteristics can include the presence of "shorts, opens, grounds and load coils", and "AC and DC voltages, resistance and capacitance". However, these measurements are not a "transfer function" as recited in claim 47. As recited in claim 47, the transfer function represents "a signal strength or signal loss for each of the plurality of xDSL frequency bands". For example, the transfer function can be a part of the "S" in the S/N ratio determination. None of the electrical characteristics mentioned in Liu correspond to the transfer function as recited in claim 47.

Further, these "electrical characteristics" in LIU are not obtained by using a TDR and receiving a return waveform as recited in claim 47.

Moreover, the Liu reference teaches away from the invention claimed. The Examiner noted that:

> "Liu discloses prior art methods have attempted to use **measurement alone** to generate rate predictions (col. 2, lines 6-7). Consequently, those prior art methods have failed because **they do not correct for the physical properties of the subscriber loop**" (emphasis added).

Thus, Liu explicitly discourages obtaining rate predictions by using measurements alone. By contrast, the present invention explicitly encourages using the measurements alone to predict the bit rate. This is because the novel method of using a TDR return waveform and using the return waveform to obtain a transfer function does take into account and correct for the physical properties of the subscriber loop.

Although Liu has the same goal as the present invention, namely to qualify an xDSL line from a single end, Liu differs completely from the present invention in that Liu uses the well-known plant map database records or "Fault & Load Coil detection". From these plant map records, Liu calculates line loss and attempts to determine if a line is xDSL qualified.

The inherent problem is that the plant records are often not accurate. As a result, there are a large number of lines in which using the Liu method does not work in terms of predicting

whether a xDSL will work for a given customer. For such a line, one of two things can happen. A service provider can be very conservative and inform the customer that DSL service cannot be provided even though it is possible. Or worse, the service provider tells the customer that the DSL service is available, but it does not work when installation is attempted.

By contrast, the present invention uses a TDR measurement and signal processing to accurately determine not only opens, shorts and cable length, but also bridged taps which are generally not available in the plant map database. From this information, a very accurate transfer function (signal loss) can be calculated by measurements alone. This transfer function based on a TDR return waveform then allows a very accurate determination as to whether a line is xDSL qualified.

Zhang also does not teach or suggest determining a transfer function from a return waveform that is obtained by a TDR at a single end. Zhang uses a standard detection technique in looking at the audio impedance of the line. This is a well known technique, where a series of audio tones are injected at known levels through a known impedance and the voltage is measured. After that, impedance is determined by using a voltage divider ratio formula. In Zhang, the only difference is that multiple tones are sent at once and measurements are also done at the same time. Thus, Zhang neither teaches nor suggests obtaining a

transfer function (signal loss) using a TDR return waveform as recited in claim 47.

Thus, the combination of Zhang and Liu also does not teach or suggest determining a transfer function based on a TDR return waveform.

Independent claim 51 similarly recites "receiving a return waveform by **using a TDR at a single end** of a wire communication line" and "determining a transfer function **based on the return waveform**". Similarly, independent claim 61 recites "**a TDR** that transmits a signal at a **single end** of a wire communication line" and "a controller device . . operable to determine a transfer function **based on the received return waveform**". For the similar reasons as discussed above with respect to claim 47, Applicant submits that independent claims 51 and 61 are also patentable over the cited references.

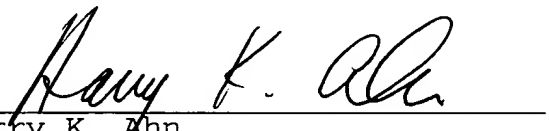
Dependent claims 48-50, 52-60 and 62-63 are also considered to be patentable by virtue of their dependency from respective independent claims 47, 51 and 61.

Applicant has added new claims 64-69. Claim 64 recites the novel feature of "**transmitting by a TDR a test signal** at a single end" and "determining a signal strength or loss of the wire communication line for each of the plurality of xDSL frequency bands **based on the obtained return waveform**". None of the cited references, either alone or in combination, teach the novel

feature of determining a signal loss over the plurality of transfer function which is based on a TDR return waveform.

Based upon the above amendments and remarks, applicants respectfully request reconsideration of this application and its early allowance. Should the Examiner feel that a telephone conference with Applicant's attorney would expedite prosecution of this application, the Examiner is urged to contact him at the number indicated below.

Respectfully submitted,



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